But these will not be the only reasons why natural selection will be slow when several qualities have to be simultaneously modified in order to maintain a certain harmony between them. When this is the case, natural selection will, as we have seen, always prevent any marked disharmony from frequently making its appearance. Nevertheless, a considerable change might take place in both qualities with advantage to the organism, if the change was simultaneous and harmonious. Fur might become thicker if at the same time it became lighter in colour; and thickness and colour might depend on separate or independent factors. In such cases the survival value of all the individuals in a competing group might be estimated by a consideration of both qualities; and when survival was decided by these qualities, the individuals worst endowed in both respects would be eliminated. Progress would thus be made in both qualities; but this improvement being shared between two qualities, natural selection would only act with about half the rapidity as if only a single quality with the same degree of variability were in question. If natural selection had, as it were, to take into account three such independently varying qualities, it would proceed with only one-third of the pace. The greater the number of qualities which had to be kept in harmonious relationships with each other, the slower must be the action of natural selection.

We may, therefore, conclude that the rate at which evolution can take place is subject to two limitations. The change in any quality must be slow in proportion both to the rigidity of the physiological or utilitarian tie which binds it to any other independently varying quality, and to the number of such other qualities to which it is thus bound.

It may perhaps here be noted that in each succeeding generation the collection of genes thus favoured by natural selection would be scattered throughout the group, the favourable combination thus quickly disappearing; but it is equally true that each such selection would result in a slight increase in the proportion of those genes which, when united in one individual, would produce an organism especially likely to survive in the struggle for life; and that this would lead to a steady but slow increase in the proportion of such individuals appearing in future generations. In other words, the regression to the mean amongst the immediate offspring of any selected group of parents must be regarded more as a wider distribution than as a loss to the race of the superior qualities of those parents. The resulting evolutionary process may be, no doubt, extraordinarily slow, but it will be none the less sure. And the number of individuals that can survive being limited, the less likely selection is to act on one quality, the more likely must it be to act on others. It follows, therefore, that an advance may be simultaneously in progress with regard to many different groups of qualities, thus resulting in a continuous improvement in the adaptation of the organism to its surroundings in many respects. An evolutionary process under the guidance of natural selection should, in fact, seldom be compared to an army beginning its advance by throwing out a few skirmishers in different directions far to the front, whilst it may generally be likened to an invisibly slow forward movement on a wide and uniform front with the leading ranks but little in front of those following behind.

Later on in the article I should have inserted the following paragraph:

The following are some of the qualities or characters in regard to which the physiological limits of variability seem to be likely to be most restricted and natural selection proportionately slow in its action: General mechanism of the whole organism (differences between plants and animals, or between fish and mammals). General position of the chief organs of the body (brain, heart, lungs, etc.) Succession of different stages of development. Internal colour. Temperature of blood, etc. On the other hand, the following qualities are examples of such as might vary independently of other qualities, making natural selection comparatively quick in its action: Scale of whole organism (height of man). Shape of external organs (horns, ears, tail, hair, leaves). External colours (flowers, buds, butterflies). Do not these two lists represent broadly the kind of differences which differentiate the larger divisions into which organisms are grouped by naturalists, and those which differentiate species?

Yours faithfully,
LEONARD DARWIN.

To the Editor, Eugenics Review

SIR,—In an article in your April issue, Mr. W. T. J. Gun virtually states that no eugenist has ever proposed restrictions on "breeding freely," except in the case of the "hopelessly inferior." Have not Major Darwin and other leading eugenists proposed such restrictions for the relatively inferior also? As practically all the more valuable couples will limit their families, eugenists must desire that the less valuable couples will do likewise. The Malthusian fact should be appreciated that, in long-settled countries, the food-growing and food-buying capacities are increased so slowly that the average number of children per marriage can hardly exceed three if all are to be adequately fed. It should therefore be a rule that no couple in the poorest third, at least, of a population should have more than two children. Moreover, this rule should be endorsed by the League of Nations, because the wider its observance the better would be the prospect for peace as well as for prosperity and race improvement.

Unless there be reduction of numbers by emi-

gration, an average of three children per marriage enables a population to increase quite rapidly, and an average of three children per fertile marriage enables a population either to increase slowly or to remain stationary. This was practically confirmed in 1920 by Dr. Louis I. Dublin's estimate of 2.6 children per marriage and 3.1 per fertile marriage as the minimum that would prevent the American population declining, and the mortality-rates on which it was calculated have doubtless improved still further since then.

Yours faithfully,
B. DUNLOP.

SIR,—With reference to Mr. Dunlop's letter, the expression 'breeding freely' in my article, which was taken from that of Professor Pearl, is perhaps a little misleading. Probably from considerations of over population in general it is not desirable that any section of the community should increase too rapidly. But I am certainly of opinion that the supply of routine workers should keep pace with the supply of the more highly skilled, otherwise there will clearly be the danger that some of the latter will fail to find employment worthy of their capacities. In any case, there is surely now a distinct movement towards limitation of families on the part of routine workers in general.

Yours faithfully,
W. T. J. GUN.

To the Editor, Eugenics Review

SIR,—Your reviewer, in speaking of my book *The Survival of the Unfittest,* gives a very wrong impression when he says that, among other signs of degeneracy, I find in *broadcasting* an "omen of doom." What I have said is that it is a great pity such an excellent means of public education should be largely used in England for the purposes of *Jazz.* No other European stations devote such a large proportion of their time to this travesty of music.

The purpose of the work is not to condemn "films, plays and broadcasting," but to show that charity and social reform, as at present understood, are mere palliatives to present suffering, which increase it a thousandfold in years to come, and that there are ways in which the philanthropist may do good *both to-day and to-morrow.*

Yours faithfully,

CHARLES W. ARMSTRONG.

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* In the chapter, "Is Degeneration a Fact," the following occurs just after statistics indicative of national degeneration: "Apart from figures, statistics, and scientific considerations, what do we find if we study the life of the people of to-day and the trend of popular taste? Generally speaking, novels, films and plays must be full of sex if they are to be successful. . . . In sculpture and painting the cult of the hideous is replacing that of the beautiful. The same is true of music and dancing." After enlarging upon this, Mr. Armstrong proceeds straight away to consider the increase in certain crimes.

E. M. (THE REVIEWER.)